

WHAT IS CLAIMED IS:

1. A transducer, comprising:
an unbalanced proof mass, said transducer being adapted to sense acceleration in at least two mutually orthogonal directions.
2. The transducer of claim 1, wherein the transducer contains a single proof mass.
3. The transducer of claim 1, wherein said transducer comprises a first set of sense fingers aligned along a first axis.
4. The transducer of claim 3, wherein said transducer further comprises a second set of sense fingers aligned along a second axis, and wherein said first and second axes are orthogonal.
5. The transducer of claim 4, wherein the first and second set of sense fingers have longitudinal axes that are parallel to a first plane.
6. The accelerometer of claim 5, wherein one of said two mutually orthogonal directions is perpendicular to said first plane.
7. The transducer of claim 1, wherein said transducer is adapted to sense acceleration in three mutually orthogonal directions.
8. The transducer of claim 1, wherein said proof mass has a central portion with a plurality of sense fingers disposed therein, and opposing sides adjacent to said central portion that are of unequal mass.
9. The transducer of claim 8, wherein said opposing sides are of unequal dimensions.

10. The transducer of claim 1, further comprising first and second capacitive plates disposed beneath said proof mass, said plates being adapted to detect movement of the proof mass along an axis perpendicular to said first plane.
11. The transducer of claim 4, wherein each of said sense fingers in said first and second set is surrounded by two parallel fingers that are fixably attached to a substrate.
12. The transducer of claim 1, wherein the proof mass is mounted to the substrate on a suspension that is compliant in at least two mutually orthogonal directions.
13. The transducer of claim 1, wherein said proof mass is mounted on a substrate, and further comprising two conductive plates that are mounted on the substrate under the proof mass.
14. The transducer of claim 4, wherein the first and second set of sense fingers are disposed in an arrangement that has at least one plane of mirror symmetry.
15. The transducer of claim 4, wherein the first and second set of sense fingers are disposed in an arrangement that has at least two planes of mirror symmetry.
16. The transducer of claim 14, further comprising two conductive plates, wherein said proof mass is mounted on a substrate, wherein said conductive plates are mounted on the substrate under the proof mass, and wherein said conductive plates are arranged with the same planes of symmetry as the first and second sets of sense fingers.
17. The transducer of claim 16, wherein the proof mass is asymmetric about the line of symmetry between the two bottom plates.
18. The transducer of claim 1, further comprising a plurality of suspension springs that are disposed in an arrangement having at least two planes of symmetry.
19. The transducer of claim 1, wherein said transducer is a two layer transducer.

20. A transducer, comprising:
a proof mass having first and second sets of fingers adapted to sense acceleration along first and second mutually orthogonal axes;
first and second capacitive plates adapted to sense acceleration along a third axis that is orthogonal to said first and second axes; and
at least one anchor for said proof mass, said anchor being attached to said proof mass;
wherein the weight of the proof mass is asymmetrically supported by the anchors and springs.
21. The transducer of claim 20, wherein said first and second plates are disposed on the same side of said proof mass.
22. The transducer of claim 20, wherein said anchors and said first and second plates are supported on a substrate.
23. The transducer of claim 20, wherein said first and second plates are adapted to capacitively sense acceleration in a direction perpendicular to said first and second axes.
24. The transducer of claim 20, wherein said transducer is an accelerometer.
25. The transducer of claim 20, wherein said transducer is a two layer transducer.
26. A transducer, comprising:
an unbalanced proof mass; and
a first set of sense fingers aligned along a first axis.
27. The transducer of claim 26, wherein said transducer further comprises a second set of sense fingers aligned along a second axis, and wherein said first and second axes are orthogonal.

28. The transducer of claim 26, further comprising first and second capacitive plates disposed beneath said proof mass, said plates being adapted to detect movement of the proof mass along an axis perpendicular to said first plane.

29. A method for making a transducer, comprising:
providing a substrate;
depositing a first conductive layer on said substrate;
patterning said first conductive layer to define first and second capacitive structures therein;
depositing a sacrificial layer over said first conductive layer;
depositing a second conductive layer over the sacrificial layer; and
patterning the second conductive layer to define a proof mass and sense fingers therein such that the center of mass of the proof mass is asymmetrically disposed relative to said first and second capacitive structures.

30. The method of claim 29, further comprising the step of removing at least a portion of the sacrificial layer to obtain release of the proof mass.

31. The method of claim 29, wherein said first and second conductive layers comprise polysilicon.

32. The method of claim 29, wherein the transducer is an accelerometer adapted to sense acceleration in a direction perpendicular to the substrate by measuring the capacitances between the proof mass and the first and second capacitive structures.

33. The method of claim 29, wherein the first and second capacitive structures are plates.

34. The method of claim 29, wherein said proof mass comprises a first set of sense fingers whose longitudinal axes are parallel to a first axis, and a second set of sense fingers whose longitudinal axes are parallel to a second axis.

35. The method of claim 29, wherein said proof mass comprises a plurality of compliant structures that support the proof mass above the first and second capacitive structures.

36. The method of claim 29, wherein said proof mass comprises a plurality of fixed fingers, and wherein each sense finger is disposed between a pair of fixed fingers.

37. The method of claim 29, wherein said proof mass comprises:
a first set of sense fingers whose longitudinal axes are parallel to a first axis, and
a second set of sense fingers whose longitudinal axes are parallel to a second axis;
a plurality of compliant structures that support the proof mass above the first and second capacitive structures; and
a plurality of fixed fingers;
wherein each sense finger is disposed between a pair of fixed fingers, and wherein the first and second sets of sense fingers, the plurality of compliant structures, and the plurality of fixed fingers are disposed in an arrangement that has at least one plane of mirror symmetry.

38. The method of claim 37, wherein the first and second sets of sense fingers, the plurality of compliant structures, and the plurality of fixed fingers are formed in the second conductive layer, and wherein the arrangement has at least two planes of mirror symmetry about a plane orthogonal to a major surface of the second conductive layer.

39. The method of claim 38, wherein the arrangement has at least a four-fold rotational axis of symmetry around an axis orthogonal to a major surface of the second conductive layer.

40. The method of claim 29, wherein the proof mass is asymmetrically disposed relative to said first and second plates.

41. The method of claim 29, further comprising the step of depositing a material on a surface of the proof mass such that the center of mass of the proof mass is asymmetrically disposed relative to said first and second plates.

42. The method of claim 41, wherein the material comprises a metal.